BEACH WALK MONITORING
ON THE NORTHERN CHANNEL ISLANDS, CALIFORNIA
2004 ANNUAL REPORT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

EXECUTIVE SUMMARY

Bald Eagles **(***Haliaeetus leucocephalus***)** were released on Santa Cruz Island in 2002 and 2003 as part of a study to determine the feasibility of restoring them to the northern Channel Islands off the coast of southern California. Bald Eagles once nested on all the northern Channel Islands, but the introduction of DDT into the Southern California Bight led to their disappearance by the early 1960's.

To better understand the potential for contamination that the Bald Eagles might acquire by feeding on carcasses, a program of Beach Walk surveys was initiated in 2002. In 2003, nine beaches on Santa Cruz Island were monitored monthly by biologists from the Institute for Wildlife Studies and the National Park Service with funding from the Montrose Settlements Restoration Program.

Standard protocols were used to conduct the surveys. Carcasses encountered were identified to species if possible and other information was collected, such as condition of the carcass, whether it was scavenged, or if it was oiled. Other information about the presence of humans, animals, and types and relative amounts of tar and marine debris was also recorded. Marine mammal carcasses are of most interest because of the potential for high contaminant levels, but bird and other animal carcasses are recorded as well.

One-time surveys were done at Santa Rosa and San Miguel Island beaches in the winter of 2003-2004. In 2004, in addition to the monthly surveys on Santa Cruz Island, we began quarterly surveys of seven beaches on Santa Rosa Island. Santa Rosa is used more frequently by pinnipeds and there are more beaches that face into the prevailing wind and currents than on Santa Cruz. Due to the logistical difficulty of sampling on San Miguel Island, no regular survey schedule has been established there.

In 2004, 128 beach walks were conducted. One hundred of these were on Santa Cruz Island, twenty four were on Santa Rosa Island, and four were on San Miguel Island. A total of 294 carcasses were observed. Of that number, roughly one third of the carcasses found were birds and two thirds were pinnipeds. Fish and other mammals comprised about 3.4% of the total. At least 19 different species of birds were represented, almost all seabirds. Among the marine mammals, the California Sea Lion (*Zalophus californianus*) was the most abundant, with a total of 104 carcasses. Northern Elephant Seal (*Mirounga angustirostris*) carcasses numbered 54, and Harbor Seals *(Phoca vitulina)* 12. There were also 13 unidentified pinnipeds, and 6 unidentified birds.

Birds were the most common carcass on Santa Cruz at 52% of the total, and pinnipeds were the most common (75%) on Santa Rosa. On San Miguel bird and pinniped numbers were about the same, but this is based on only two surveys.

Most of the carcasses (90%) were recorded as scavenged. Bald Eagles and other birds have been observed feeding on beached carcasses. A few carcasses were lightly oiled, 2.4%, but it is not known whether they were oiled before or after death. Many were in an advanced state of decomposition.

ACKNOWLEDGEMENTS

We thank the Institute for Wildlife Studies (IWS), University of California Natural Reserve, Santa Cruz Island, and The Nature Conservancy (TNC) for conducting surveys and providing access to the island beaches on TNC property. Funding for the project was made available by the Montrose Settlements Restoration Program.

INTRODUCTION

In 2002, a Bald Eagle reintroduction program began at Channel Islands National Park with the release of twelve eagles on Santa Cruz Island. Bald Eagles once nested on all the Channel Islands off the coast of southern California, but disappeared by the early 1960s. Contamination from the organochlorine pesticide, DDT, is thought to be the main cause of the disappearance of Bald Eagles from the Southern California Bight. DDE (a metabolite of DDT) levels are magnified through the food chain by bioaccumulation since the chemicals are stored in animal fat and do not readily breakdown.

To gain a better understanding of the potential contamination that Bald Eagles might acquire by feeding on beached animals, a program of Beach Walk surveys was initiated. A pilot study was initiated in June 2002, on East Santa Cruz Island beaches, to adapt the Beach Walk protocol and develop a database. In 2003, monitoring was expanded to include west Santa Cruz, Santa Rosa, and San Miguel Islands (Richards and Rich 2004). Nine beaches on Santa Cruz Island were monitored monthly by biologists from the Institute for Wildlife Studies (IWS) and the National Park Service (NPS). Quarterly monitoring of seven beaches on Santa Rosa Island began in 2004. Two beaches on San Miguel Island were monitored twice in 2004. Funding for this program came from the Montrose Settlements Restoration Program. This report summarizes the results of 2004, our second full year of surveys.

STUDY AREA

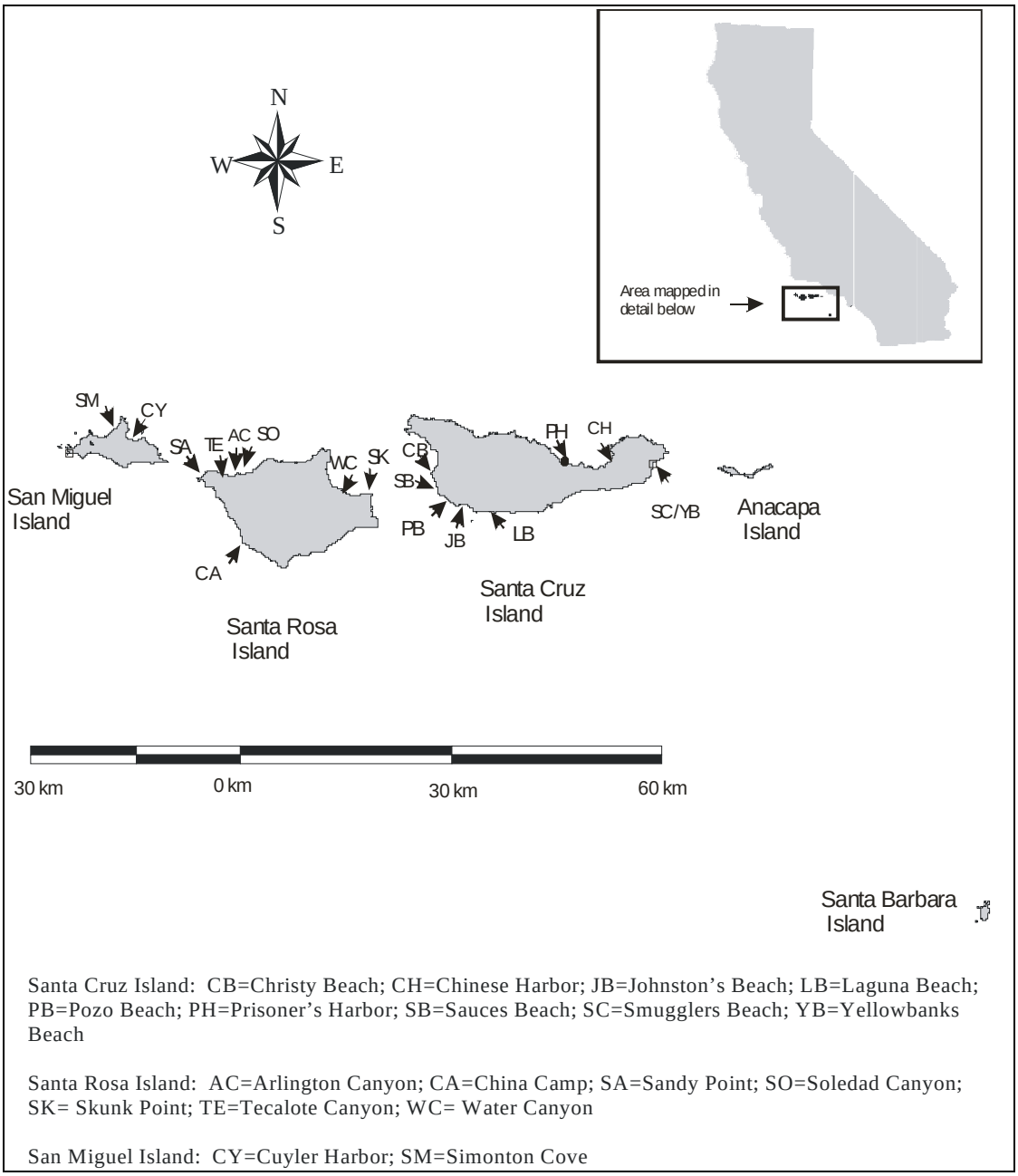
Santa Cruz Island is located approximately 20 miles off the coast of Ventura and Santa Barbara counties. Santa Cruz Island is the largest of the eight California Channel Islands with a land area of approximately 96 square miles and a coastline of about 77 miles. In 2004, nine beaches on Santa Cruz Island were monitored monthly by biologists from the Institute for Wildlife Studies (IWS) and the National Park Service (NPS). Beaches monitored include Chinese Harbor, Prisoner's Harbor, Laguna Beach, Johnston's Beach, Poza (Pozo) Beach, Sauces Beach, Christy Beach, Smugglers Cove and Yellowbanks Beach (See Fig.1). These sites were chosen because they are the largest and most accessible beaches covering most of the coastline. The beaches on the northwest portion of the island are generally small pocket beaches and access is difficult except by boat.

Santa Rosa Island is the second largest of the Channel Islands, and lies six miles to the west of Santa Cruz Island, about 26.5 miles off the mainland coast from Santa Barbara. It is about 84 square miles in size. The first survey of Santa Rosa beaches was conducted in November 2003. In 2004, NPS personnel conducted surveys on seven beaches on a quarterly basis, in April, July, and October. Beaches monitored include Sandy Point, Tecalote Canyon, Arlington Canyon, Soledad Canyon, Skunk Point, Water Canyon, and China Camp (See Fig. 1). Compared to Santa Cruz, Santa Rosa is used more frequently by pinnipeds and there are more beaches that face into the prevailing wind and currents.

San Miguel Island is about 14 square miles in size, with 27 miles of coastline. It is located three miles west of Santa Rosa Island, and is the farthest west of the Channel Islands. Point Bennett, on the southwestern tip of the island, and Cardwell Point on the southeastern end, are well known pinniped breeding areas. Surveys were conducted by NPS personnel on San Miguel Island in January and May of 2004. Beaches monitored include Cuyler Harbor and Simonton Cove (See Fig. 1). However, due to the logistical difficulty of sampling there, no other surveys were conducted on San Miguel this year.

Wind and current modeling by the Minerals Management Service (MMS) show that Santa Cruz Island has the potential for being the most impacted island in the event of an oil spill. Generally, beaches facing northwest into the prevailing winds are the most susceptible to oil fouling and also to deposition of

debris and potentially to beached animal carcasses. A five year marine debris monitoring program from 1989-1993 on Santa Rosa and San Miguel Islands supported this model with Sandy Point on Santa Rosa and Simonton Cove on San Miguel Island having the most debris (Richards 1994). Both beaches face northwest.



Santa Cruz Island: CB=Christy Beach; CH=Chinese Harbor; JB=Johnston's Beach; LB=Laguna Beach; PB=Pozo Beach; PH=Prisoner's Harbor; SB=Sauces Beach; SC=Smugglers Beach; YB=Yellowbanks Beach

Santa Rosa Island: AC=Arlington Canyon; CA=China Camp; SA=Sandy Point; SO=Soledad Canyon; SK= Skunk Point; TE=Tecalote Canyon; WC= Water Canyon

San Miguel Island: CY=Cuyler Harbor; SM=Simonton Cove

Figure 1. Locations of monitored beached on the Channel Islands

METHODS

The beached animal survey methods were adapted primarily from Beach Watch programs at the Gulf of the Farallones and Monterey Bay National Marine Sanctuaries. A standard data sheet was developed for this program and a handbook was written to describe the program and standardize the field protocol (Richards and Rich 2004). A database was created using Microsoft Access by Laurie Kurilla of Peace of Mind Technology under contract to the NPS.

Beaches were monitored at low tide if possible to maximize the likelihood of finding beached organisms. Biologists walked the beaches monthly or quarterly, documenting findings onto a standard datasheet. Beached animals were the primary interest of the surveys; however, numbers of live animals present and notes on marine debris, and human activity were also recorded. Information about each carcass included species identification (if possible), stage of decomposition, age and sex (if possible), presence of tags, evidence of scavenging, evidence for cause of death, the presence of oil, and whether a photograph was taken. Photos are archived for verification of questionable identification and to create a reference/training library for monitors. A toe is clipped from bird carcasses to mark it for future identification, and if found again a second toe is clipped.

Surveys this year were conducted by Paula Rich (PJR), Dan Richards (DVR), and David Kushner (DJK) of the National Park Service, and Jessica Dooley (JAD), Andrew Grant (ARG), and Dave Rempel (DTR) of the Institute for Wildlife Studies. (See Appendix A, list of survey dates, locations, and surveyors).

The Santa Rosa beaches are normally sampled once per quarter. The Santa Cruz beaches are normally sampled once per month. Occasionally, weather or road conditions prevent access to a beach and a monitoring event is missed. Sometimes a beach which is not on our Beach Walk schedule is surveyed if the opportunity presents itself. Willows Anchorage on Santa Cruz, Bee Rock (East and West) and the beach north of Cluster Point on Santa Rosa were additional beaches surveyed this year.

Documenting an “unknown” pinniped. Santa Rosa Island, July 2004.

RESULTS

Carcass types, amounts, and conditions

In 2004, 128 beach walks were conducted. One hundred of these were on Santa Cruz Island, twenty four were on Santa Rosa Island, and four were on San Miguel Island. Appendix B summarizes the sites and dates monitored. Tables 1 through 7 summarize the condition, type, and number of beached organisms found on each island.

The total number of carcasses found on all three islands was 294. Roughly one third of the carcasses were birds (101 or 34.3%) and two thirds (183 or 62.2%) were pinnipeds. Fish and other mammals comprised about 3.4% of the total. At least 19 different species of birds were represented, all seabirds except for two Red-tailed Hawk carcasses. The single most common bird species was Northern Fulmar *(Fulmarus glacialis)* with 27, followed by Western Gull (*Larus occidentalis*) with 22. Among the marine mammals, the California Sea Lion (*Zalophus californianus*) was the most abundant carcass, with a total of 104 found. Northern Elephant Seal (*Mirounga angustirostris*) carcasses numbered 54, and Harbor Seals *(Phoca vitulina)* 12. There were also 13 unidentified pinnipeds, and 6 unidentified birds. These were typically carcasses so decomposed or torn apart that positive identification was not possible.

Birds were the most common carcass on Santa Cruz at 52% of the total, and pinnipeds were the most common (75%) on Santa Rosa. On San Miguel bird and pinniped carcass numbers were about the same based on only two surveys. A Northern Fulmar mortality event was picked up in one San Miguel survey, probably giving us atypical data for that period.

Many of the carcasses, about 43.5%, were in an advanced state of decomposition and recorded as dried/mummified. These were probably present on the beach for weeks or months, and may have been counted in our surveys more than once. While at one time birds may have scavenged them, it is doubtful that they had been a food source close to the time we observed the carcass. About the same amount, 45.2%, were in some state of active decomposition and about 10.5% were recorded as freshly dead. It is more likely that these carcasses would be actively scavenged by birds.

There was also one live California Sea Lion found at Yellowbanks which had head wounds and was classified as “live dying”, but it is unknown whether the wounds were severe enough to eventually cause death, or whether the animal did die. The cuts on its muzzle and head suggested injury from a boat propeller.

Table 1. Amounts and conditions of carcasses, all monitored islands, 2004

294 total carcasses
265 scavenged (90% of total)
7 oiled (6 at <2%, 1 at 2-33%) (2.4% of total)

	1 (alive, dying)	2 (fresh dead)	3 (decomposing)	4 (dried, mummified)	Total
Birds	0	19	30	52	101 (34.3%)
Fish	1	2	0	3	6 (2.0%)
Pinnipeds	1	10	100	72	183 (62.2%)
Other mammals	0	0	3	1	4 (1.4%)
Total	2 (0.7%)	31 (10.5%)	133 (45.2%)	128 (43.5%)	294

In most cases the cause of death could not be determined. About 2.4% of the carcasses were oiled. In most cases the amount was minor (<2% oil cover). It cannot be determined how many of these were oiled posthumously after reaching the beach.

About 90% of the carcasses had been scavenged to some extent. It was not always possible to determine if a carcass in an advanced state of decomposition had been scavenged in an earlier decompositional state. Of the bird carcasses, 14 were recorded as possible predatory kills based on the condition of the carcass. Typically, the breast meat or heart is missing in a bird predated by a Peregrine Falcon, for example.

Santa Cruz Island

Santa Cruz Island was sampled the most regularly and consistently of the three islands. A total of 100 beach walks were conducted on 10 different beaches on Santa Cruz Island in 2004. As in 2003, seabirds were the most common carcasses on the Santa Cruz Island beaches, with 35 (52%) in all. At least 8 different species were represented, a fairly low diversity given the number of surveys and area covered. California Sea Lions were also common, with 26 carcasses. Two Harbor Seals were found, but no Northern Elephant Seals. Pinnipeds comprised 41% of the carcasses, a much lower percentage than Santa Rosa's 75%. Three fish carcasses were also found. Of the Santa Cruz beaches, Chinese Harbor beach had the highest carcass count of both birds and marine mammals. One unusual find was a Black-footed Albatross *(Diomedea nigripes)* carcass at Laguna Beach. A feral pig (*Sus scrofa*) carcass was observed at Prisoner's Harbor.

As on Santa Rosa, many of the carcasses were scored as dried/mummified (41.2%), with decomposing close behind at 39.7%. The percentage of fresh dead carcasses is the highest of the islands, at 17.6%. This is probably a reflection of the shorter time period between surveys, giving the surveyor a better chance to find fresher carcasses. Studies have shown that 30 to 50 percent of new bird carcasses disappear within the first week of being recorded (Benson, et al. 1999).

Almost 80% were recorded as scavenged, and 2 of the 68 carcasses were oiled.

Table 2. Amounts and conditions of carcasses, Santa Cruz Island, 2004

68 total carcasses
54 scavenged (79.4% of total)
2 oiled (1 at <2%, 1 at 2-33%) (2.9% of total)

	1 (alive, dying)	2 (fresh dead)	3 (decomposing)	4 (dried mummified)	Total
Birds	0	9	3	23	35 (52%)
Fish	0	2	0	1	3 (4%)
Pinnipeds	1	1	23	3	28 (41%)
Other mammals	0	0	1	1	2 (3%)
Total	1 (1.5%)	12 (17.6%)	27 (39.7%)	28 (41.2%)	68

Table 3. Beached animals found on Santa Cruz Island, 2004

	Beach (number of surveys)									
Prey Item	SC-CB (10)	SC-CH (15)	SC-JB (12)	SC-LB (12)	SC-PB (12)	SC-PH (12)	SC-SB (11)	SC-SC (9)	SC-YB (6)	Total
Birds										**35**
Black-footed Albatross *(Diomedea nigripes)*				1						1
Brandt's Cormorant *(Phalacrocorax penicillatus)*		3						2		5
Brown Pelican (*Pelecanus occidentalis*)		1						1		2
California Gull *(Larus californicus)*	1									1
Common Murre *(Uria aalge)*								1		1
Cormorant *(Phalacrocoracidae)*		3				2				5
Unidentified gull (*Larus* spp.)		2								2
Northern Fulmar (*Fulmarus glacialis*)	1						1	1		3
Western Gull (*Larus occidentalis*)	1			3		1		2	2	9
Unidentified bird		2						4		6
Fish										**3**
Unidentified fish	1				1					2
Thornback Ray *(Platyrhinoidis productus*)									1	1
Pinnipeds										**28**
California Sea Lion (*Zalophus californianus*)		12	3		2	3	2	2	2	26
Harbor seal *(Phoca vitulina)*		1					1			2
Other mammals										**2**
Feral pig (*Sus scrofa*)						1				1
Unidentifiable Item (mammal?)		1								1
Total	4	25	3	4	3	7	4	13	5	**68**

Santa Cruz Island: CB=Christy Beach; CH=Chinese Harbor; JB=Johnston's Beach; LB=Laguna Beach; PB=Pozo Beach; PH=Prisoners Harbor; SB=Sauces Beach; SC=Smuggler's Cove; YB=Yellowbanks Beach

Santa Rosa Island

On Santa Rosa Island, 24 beach walks were conducted on 10 different beaches in 2004. About 75% of the carcasses were pinnipeds, with the most common being California Sea Lion at a total count of 63. Northern Elephant Seal carcasses numbered 50, and an additional 13 pinniped carcasses were classified as unidentified. Bird carcasses numbered 41, 23% of the total, with all but 2 (Red-tailed Hawks *(Buteo jamaicensis)*) being seabirds. At least 13 different species were represented. Three fish carcasses were also found. Sandy Point and Soledad all had high numbers of marine mammal carcasses, with 31 and 30 respectively. Sandy Point had the largest overall number of carcasses at 46. A large cetacean, identified as a male Risso's Dolphin *(Grampus griseus),* was found at Sandy Point. A Mule Deer (*Odocoileus hemionus)* carcass was found at the base of the cliff at Water Canyon.

Sandy Point, Santa Rosa Island, October, 2004.

As on Santa Cruz, many of the carcasses, 47.8%, were dried/mummified, with a slightly lower percentage scored as decomposing. The percentage of fresh dead was relatively low at 6.7%, not surprising given the lower number of surveys compared to Santa Cruz. Almost all had been scavenged to some extent, and only 2 of the 178 carcasses were lightly oiled.

Table 4. Amounts and conditions of carcasses, Santa Rosa Island, 2004

178 total carcasses
165 scavenged (92.7%)
2 oiled (all at <2%) (1.1 %)

	1 (alive, dying)	2 (fresh dead)	3 (decomposing)	4 (dried mummified)	Total
Birds	0	6	11	24	41 (23.0%
Fish	1	0	2	0	3 (1.7%)
Pinnipeds	0	6	65	61	132 (74.2%)
Other mammals	0	0	2	0	2 (1.1%)
Total	1 (0.6%)	12 (6.7%)	80 (44.9%)	85 (47.8%)	178

Table 5. Beached animals found on Santa Rosa Island, 2004

	Beach (number of surveys)									
Prey Item	SR-AC (3)	SR-BE (1)	SR-CA (3)	SR-CL (1)	SR-SA (3)	SR-SK (3)	SR-SO (3)	SR-TE (2)	SR-WC (4)	Total
Birds										**41**
Brandt's Cormorant *(Phalacrocorax penicillatus)*					1		1			2
Brown Pelican (*Pelecanus occidentalis*)					1	4				5
Common Raven *(Corvus corax)*			1					1		2
Cormorant *(Phalacrocoracidae)*	1									1
Horned Grebe *(Podiceps auritus*)	1									1
Northern Fulmar (*Fulmarus glacialis*)					4		1			5
Pacific Loon *(Gavia pacifica)*							1			1
Pelagic Cormorant *(Phalacrocorax pelagicus)*				1				1		2
Pink-footed Shearwater *(Puffinus creatopus)*					4					4
Pigeon Guillemot *(Cepphus columba)*									1	1
Red-tailed Hawk *(Buteo jamaicensis)*					1	1				2
Sooty Shearwater *(Puffinus griseus)*						1	1			2
Surf Scoter *(Melanitta perspicillata)*						1				1
Western Gull (*Larus occidentalis*)	1		1	1	2	2	2		3	12
Fish										**3**
Cabezon *(Scorpaenichthys marmoratus)*					1					1
Ocean Sunfish *(Mola mola)*						1				1
Unidentified fish							1			1
Pinnipeds										**132**
California Sea Lion (*Zalophus californianus*)	4	1	3	5	10	15	16	8	1	63
Northern Elephant Seal *(Mirounga angustirostris)*	6	1	8	2	18	4	11			50
Harbor Seal *(Phoca vitulina)*				1	2	2	1			6
Unidentified pinniped	1	3	2		1	4	2			13
Other mammals										**2**
Risso's Dolphin *(Grampus griseus)*					1					1
Mule deer (*Odocoileus hemionus)*									1	1
Total	14	5	15	10	46	35	37	10	6	**178**

Santa Rosa Island: AC=Arlington Canyon; BE=Bee Rock East; CA=China Camp; CL=Cluster Point; SA=Sandy Point; SC=Smuggler's Cove; SK=Skunk Point; SO=Soledad Beach; TE=Tecalote Beach; WC=Water Canyon
(BE and CL are not part of the regular Beach Walk schedule)

Risso's Dolphin found on Santa Rosa Island, showing holes which suggest carcass has been scavenged.

San Miguel Island

The 2003 Annual Report referred to the January 2004 survey on San Miguel, but we will also present the data here in order to be inclusive of the year 2004. The most common carcass in 2004 was the Northern Fulmar *(Fulmarus glacialis),* with 18 found in January alone, seemingly part of a mortality event documented elsewhere along the Pacific coast that winter. Many Northern Fulmars were also recorded in the November 2003 Santa Rosa survey. From two surveys of two beaches on San Miguel, seabird carcasses numbered 25. Of the marine mammals, California Sea Lion carcasses numbered 15, Northern Elephant Seals 4, and Harbor Seals 4. Most of these were found on Simonton Cove, a northwest facing beach which tends to have a high degree of deposition.

The percentage of decomposing carcasses is the highest of the three islands at 54%, and the percentage of fresh dead is also relatively high, but this is largely a result of the unusual number of Northern Fulmar carcasses present on the beach in January. Like the other islands, almost all of the carcasses had been scavenged, and a small percent were oiled.

Table 6. Amounts and conditions of carcasses found on San Miguel Island, 2004

48 total carcasses
46 scavenged (96% of total)
3 oiled (all at <2%) (6.3% of total)

	1 (alive, dying)	2 (fresh dead)	3 (decomposing)	4 (dried mummified)	Total
Birds	0	4	14	7	25 (52%)
Fish	0	0	0	0	0
Pinnipeds	0	3	12	8	23 (48%)
Other mammals	0	0	0	0	0
Total	0	7 (14.6%)	26 (54%)	15 (31%)	48

Table 7. Beached animals found on San Miguel Island, 2004

	Beach (number of surveys)		
Prey Item	SM-CH (2)	SM-SM (2)	Total
Birds			**25**
Common Loon *(Gavia immer)*	1		1
Double-crested Cormorant *(Phalacrocorax auritus)*		1	1
Northern Fulmar (*Fulmarus glacialis*)		19	19
Pelagic Cormorant *(Phalacrocorax pelagicus)*	2		2
Rhinoceros Auklet *(Cerorhinca monocerata)*		1	1
Western Gull (*Larus occidentalis*)		1	1
Pinnipeds			**23**
California Sea Lion (*Zalophus californianus*)	2	13	15
Northern Elephant Seal *(Mirounga angustirostris)*		4	4
Harbor Seal *(Phoca vitulina)*	4		4
Total	9	39	**48**

San Miguel Island: CH-Cuyler Harbor; SM=Simonton

TEMPORAL CHANGES

Santa Cruz Island

On Santa Cruz the greatest number of carcasses, 17 in all, were found in December. Both pinnipeds and birds were at their highest amounts, at 9 and 8 respectively. The same number of birds was also found in April. The month with the lowest amount of carcasses was September, when none of any kind were located. There were four months when no pinniped carcasses were recorded, in January, February, September, and October.

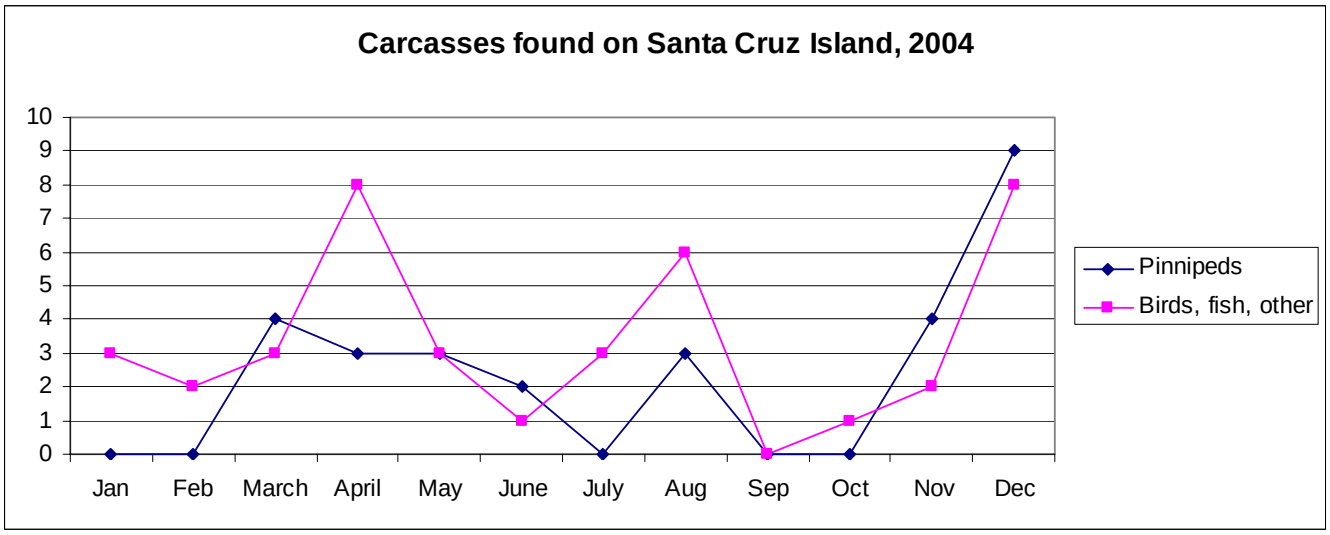
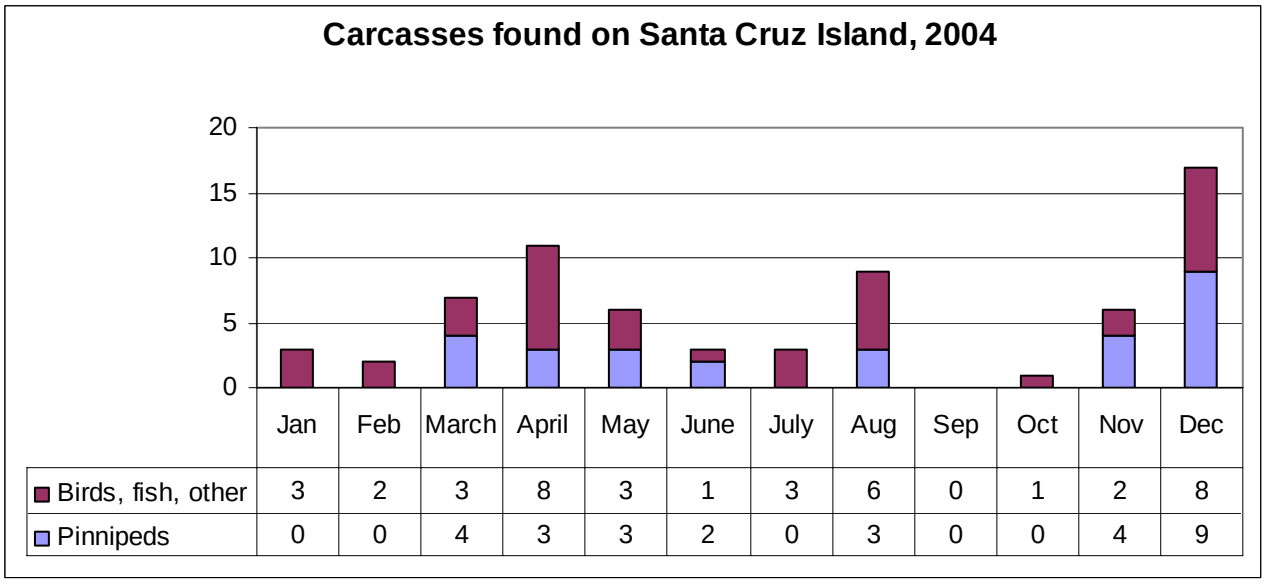


Figure 2. Numbers of carcasses found on Santa Cruz Island, 2004



	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Birds, fish, other	3	2	3	8	3	1	3	6	0	1	2	8
Pinnipeds	0	0	4	3	3	2	0	3	0	0	4	9

Figure 3. Numbers of carcasses found on Santa Cruz Island, 2004

Santa Rosa Island

On Santa Rosa, the largest number of carcasses, 77, was recorded in November of 2003. (This survey period is included in the chart below for comparison purposes). However, 35 of these were Northern Fulmars, part of the mortality event observed that winter. In 2004, the greatest number of carcasses, 67, was observed in July and the lowest, 54, in October. Pinnipeds were the most abundant carcass overall, and their numbers were fairly consistent through the three surveys in 2004. The highest number, 49, was recorded in the April survey, and lowest was 21 in November of 2003. Not including 2003, birds were at their highest in July, at 21, and lowest in April, at 7. One carcass not included in the table is a mule deer observed in December at Water Canyon. Since this was the only beach that was surveyed in December due to weather conditions, and only one carcass was found, it was not included on the table.

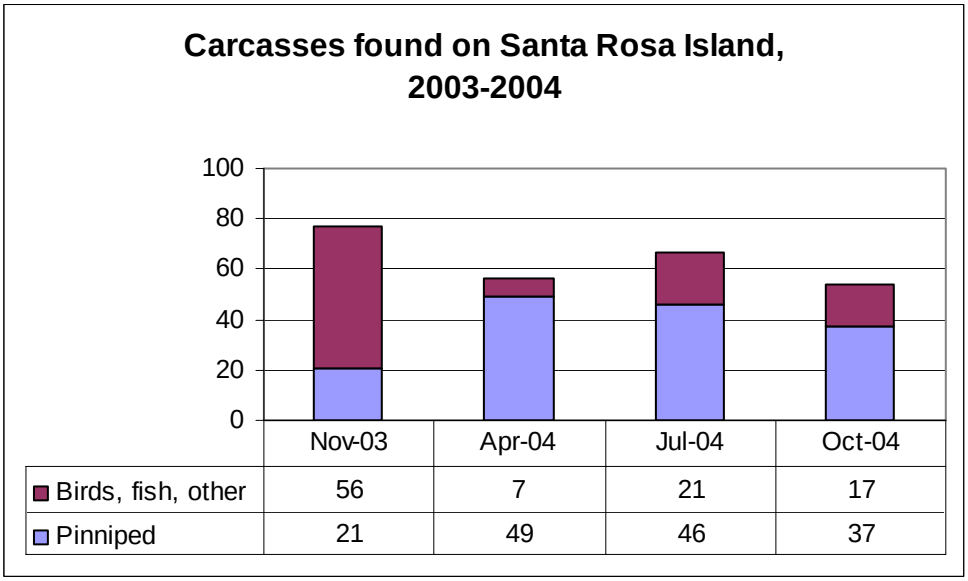


Figure 4. Numbers of carcasses found on Santa Rosa Island, 2003-2004

San Miguel Island

Only two surveys were conducted on San Miguel Island in 2004. In January, 18 of the 20 bird carcasses recorded were Northern Fulmars, part of the mortality event mentioned previously. Taking this anomaly into consideration, the two surveys do not differ greatly in numbers of birds and pinniped carcasses seen.

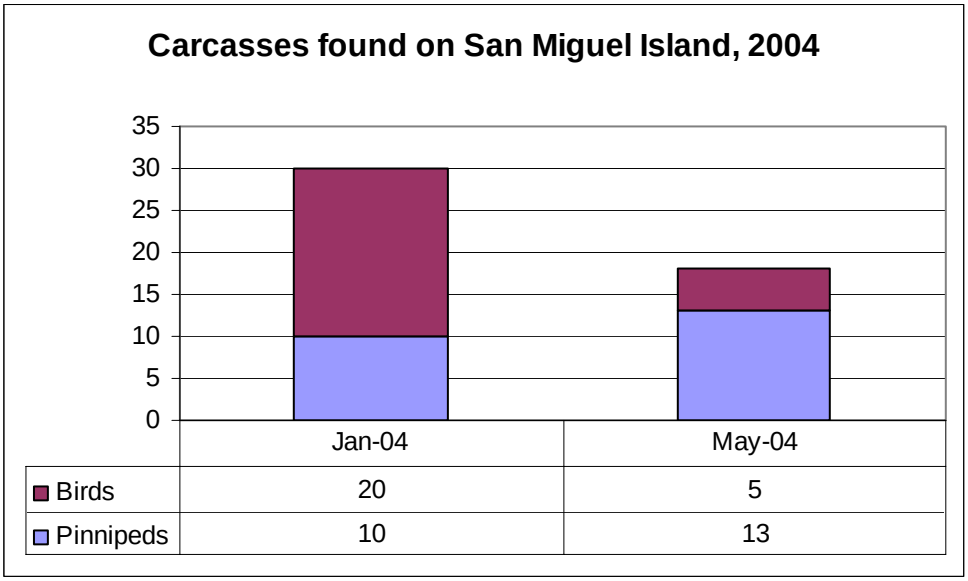


Figure 5. Numbers of carcasses found on San Miguel Island, 2004

AGE AND SEX OBSERVATIONS

Two thirds of the California Sea Lion carcasses were adults, while 87% of the Northern Elephant Seals were categorized as immature, and 83% of the Harbor Seals were pups. In many cases the sex could not be determined due to the decompositional state and/or the immaturity of the animal. Birds were largely adults, with the sex unknown.

Table 8. Numbers of pinnipeds and birds by age and sex

Age	California Sea Lion		Northern Elephant Seal		Harbor Seal		Bird	
Adult	68	6M 33F 29U	6	2F 3M 1U	1	U	46	1M 45U
Pup	0		1	U	10	10U	0	
Immature or first year	27	4F 2M 21U	47	2M 44U	0		15	15U
Unknown age	9	9U	0		1	U	41	41U

M = male, F = female, U = unknown sex

DISCUSSION

During 2004, there were approximately 5 Bald Eagles on Santa Cruz Island. Eagles are often seen on Santa Cruz beaches. They have been observed to be feeding on beached marine mammal carcasses 12 times in the past year, with sometimes up to 7 eagles present at one carcass. In 2003, eagles were observed near or feeding on marine mammal carcasses 5 times. They are most often seen at Chinese Harbor and Prisoners Harbor. An eagle was also observed feeding on a cormorant carcass at Prisoners. (J. Dooley, pers.com.) Of the Santa Cruz beaches, Chinese Harbor had the highest number of beached pinnipeds and the highest overall carcass count, and Prisoners Harbor had the third highest carcass count. Bald Eagles are often seen feeding on feral pig carcasses as well.

On Santa Rosa, GPS tracking of birds with transmitters indicates use of the southwest beaches such as China Camp, Cluster Point, and Johnson's Lee. There were approximately 15 Bald Eagles on Santa Rosa Island during 2004. Eagles have been observed feeding on Northern Elephant Seal afterbirth and have been seen perched on cliffs above these beaches. (J. Dooley, pers.com.) The northwestern beaches had the greater numbers of carcasses in our surveys, but pinnipeds are known to frequent the southwest beaches. On Santa Rosa, eagles are also seen feeding on deer and elk carcasses.

On San Miguel Island, one Bald Eagle was present for a few months in 2004 but as of January 2005 had moved over to Anacapa (J. Dooley, pers.com.). No observations of feeding behavior by Bald Eagles are known from San Miguel.

It is rare to find beached cetacean carcasses, although we recorded a male Risso's Dolphin on Santa Rosa Island. Several Bald Eagles were observed feeding on a Common Dolphin *(Delphinus delphis)* carcass at Chinese Harbor over the course of 5 days in August 2004. Cetaceans are also known to accumulate contaminants in their bodies, which can be passed on to scavenging birds.

These observations demonstrate that Bald Eagles do feed on marine mammals and other carcasses on island beaches, along with available pig and ungulate carcasses. It is worth noting that the pigs on Santa Cruz are scheduled for eradication in the next few years, and the ungulates on Santa Rosa will be removed starting in 2008. These carcasses will then be unavailable to eagles, and they may make more use of beached carcasses.

Fourteen samples of adipose and muscle were taken for DDT/PCB analysis from 7 sea lions on Santa Cruz, along with 8 samples for stable isotope. Stable isotope samples were also taken from 6 seabirds. Results are not yet available. (J. Dooley, pers.com.)

Most of the carcasses appeared to have been scavenged at some point, similar to last year's observations. Birds such as Ravens and gulls were often observed in the area of newer carcasses and were observed actually feeding on some. Some of the seabird carcasses were missing the breast muscle or heart, which is typical of a predatory bird kill. Some of the seabirds may have been predated by falcons rather than scavenged after being deposited on the beach.

Western Grebe, probably predated by Peregrine Falcon. Santa Rosa Island, Nov. 2003

In almost all cases, it was not possible to determine the cause of death. One Sooty Shearwater *(Puffinus griseus)* at Soledad had a fishhook in its breast. Few of the carcasses had any oil or tar on them, and those that did may have been tarred after death. Tar occurs naturally in the area due to underwater seeps.

The Northern Fulmar mortality event was reported in our 2003 Annual Report. The presence of an unusually high number of these birds on San Miguel beaches had some effect on our 2004 data. The number of bird carcasses on San Miguel and on the islands as a group was inflated somewhat.

Both San Miguel and Santa Rosa have increasing numbers of breeding Northern Elephant Seals, and they are being observed on more and more beaches. Their pups are usually born in January and February. This also makes our beach walks more difficult, as we don't want to disturb these animals as we look for carcasses. Areas with probable high numbers of carcasses from pup mortalities are sometimes also areas where beach walks cannot be conducted. San Miguel's Point Bennett and Cardwell Point, for example, attract many breeding pinnipeds. NMFS biologists monitor the California Sea Lions, Harbor Seals, Elephant Seals, and Northern Fur Seals (*Callorhinus Ursinus*) at Point Bennett and measure pup mortality during the summer breeding season. So far, no Bald Eagles have been observed feeding at Point Bennett, although one has been seen in the area (Robert DeLong, pers.com.)

As in 2003, many of the carcasses were in an advanced state of decomposition and recorded as dried/mummified. These were probably present on the beach for weeks or months, and may have been counted in our surveys more than once. While at one time birds may have scavenged them, it is doubtful that they had been a food source close to the time we recorded the carcass. Over half the carcasses were in some state of active decomposition or categorized as freshly dead. It is more likely that these carcasses would be actively scavenged by birds. In considering available food for eagles, dried/mummified carcasses should probably be discounted.

No temporal trend can be implied from our data yet. Sampling in 2003 did not occur throughout the entire year at all beaches for Santa Cruz, Santa Rosa was sampled only once, and San Miguel not at all. With more replications, we may eventually begin to see a pattern.

The amount of kelp wrack present on the beach can have an effect on the surveyor's ability to detect carcasses. Mounds of kelp several feet thick sometimes build up, especially on the northwest facing beaches. Carcasses could be present underneath, but it is impossible to sort through this amount of seaweed.

Most of the California Sea Lion carcasses were adults, while Northern Elephant Seals were mostly immature, and Harbor Seals were almost all pups. In many cases the sex could not be determined due to the decompositional state and/or immaturity of the animal. Birds were largely adults, with the sex unknown. As with the temporal data, more replications may be needed to discern a trend. It is typical of the islands, however, that adult Harbor Seals are rarely seen beached, (pups are much more likely to be found), and that immature "weaner" Elephant Seals experience higher mortality rates than adults.

The higher rate of fresh dead carcasses on Santa Cruz Island, compared to Santa Rosa, is probably a reflection of the shorter time period between surveys, giving the surveyor a better chance to find fresher carcasses. Studies based on a weekly sampling schedule have shown that 30 to 50 percent of new bird carcasses disappear within the first week of being recorded. However, the same study concluded that monthly surveys were successful for describing trends in distribution and abundance of beached birds and mammals. Major deposition events can be detected by monthly sampling (Benson, et al, 1999). During our beach walks, a toe was clipped from all bird carcasses (if possible) to mark it for future identification. Only one individual, a Brown Pelican (*Pelecanus occidentalis*), was found a second time. Due to the logistics of sampling on island beaches, we plan to continue monthly sampling on Santa Cruz and quarterly sampling on Santa Rosa. San Miguel sampling will continue to be opportunistic.

An undescribed species found at Santa Cruz Island, Scorpion Anchorage, Nov. 2004.

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Appendix A. List of survey dates, locations, and surveyors

In alphabetical order by beach

Paula Rich (PJR), Dan Richards (DVR), David Kushner (DJK) (National Park Service)
Jessica Dooley (JAD), Andrew Grant (ARG), Dave Rempel (DTR) (Institute for Wildlife Studies)

Beach	Monitor Event Date	Primary Surveyor
SC-CB	1/7/2004	JAD
SC-CB	2/6/2004	DTR
SC-CB	3/5/2004	DTR
SC-CB	4/2/2004	DTR
SC-CB	5/18/2004	DTR
SC-CB	6/15/2004	DTR
SC-CB	8/21/2004	ARG
SC-CB	9/7/2004	ARG
SC-CB	10/12/2004	ARG
SC-CB	11/5/2004	JAD
SC-CH	1/25/2004	DTR
SC-CH	2/17/2004	JAD
SC-CH	3/17/2004	JAD
SC-CH	3/17/2004	DTR
SC-CH	4/9/2004	JAD
SC-CH	5/12/2004	JAD
SC-CH	5/12/2004	DTR
SC-CH	6/7/2004	JAD
SC-CH	6/7/2004	DTR
SC-CH	7/27/2004	DTR
SC-CH	8/29/2004	JAD
SC-CH	9/29/2004	JAD
SC-CH	10/9/2004	ARG
SC-CH	11/26/2004	JAD
SC-CH	12/9/2004	JAD
SC-JB	1/8/2004	DTR
SC-JB	2/24/2004	JAD
SC-JB	3/19/2004	DTR
SC-JB	4/28/2004	JAD
SC-JB	5/15/2004	DTR
SC-JB	6/30/2004	JAD
SC-JB	7/31/2004	DTR
SC-JB	8/30/2004	JAD
SC-JB	9/28/2004	ARG
SC-JB	10/23/2004	JAD
SC-JB	11/21/2004	JAD
SC-JB	12/14/2004	JAD
SC-LB	1/6/2004	JAD
SC-LB	2/19/2004	DTR
SC-LB	3/3/2004	DTR
SC-LB	4/17/2004	DTR
SC-LB	5/22/2004	DTR
SC-LB	6/19/2004	DTR
SC-LB	7/13/2004	DTR
SC-LB	8/8/2004	ARG
SC-LB	9/18/2004	ARG
SC-LB	10/24/2004	DTR
SC-LB	11/19/2004	JAD
SC-LB	12/9/2004	JAD

Beach	Monitor Event Date	Primary Surveyor
SC-PB	1/8/2004	DTR
SC-PB	2/24/2004	JAD
SC-PB	3/19/2004	JAD
SC-PB	4/28/2004	DTR
SC-PB	5/15/2004	DTR
SC-PB	6/30/2004	DTR
SC-PB	7/31/2004	JAD
SC-PB	8/30/2004	DTR
SC-PB	9/28/2004	JAD
SC-PB	10/12/2004	ARG
SC-PB	11/21/2004	DTR
SC-PB	12/14/2004	DTR
SC-PH	1/23/2004	DTR
SC-PH	2/5/2004	DTR
SC-PH	3/2/2004	JAD
SC-PH	4/16/2004	DTR
SC-PH	5/11/2004	DTR
SC-PH	6/3/2004	DTR
SC-PH	7/9/2004	JAD
SC-PH	8/6/2004	ARG
SC-PH	9/6/2004	ARG
SC-PH	10/10/2004	ARG
SC-PH	11/7/2004	DTR
SC-PH	12/4/2004	JAD
SC-SB	1/7/2004	JAD
SC-SB	2/6/2004	DTR
SC-SB	3/5/2004	DTR
SC-SB	4/2/2004	DTR
SC-SB	5/18/2004	JAD
SC-SB	6/15/2004	JAD
SC-SB	7/31/2004	DTR
SC-SB	8/21/2004	ARG
SC-SB	9/7/2004	ARG
SC-SB	10/23/2004	DTR
SC-SB	11/5/2004	DTR
SC-SC	2/6/2004	DJK
SC-SC	3/15/2004	DVR
SC-SC	4/23/2004	PJR
SC-SC	5/27/2004	PJR
SC-SC	7/3/2004	PJR
SC-SC	8/12/2004	PJR
SC-SC	10/5/2004	PJR
SC-SC	11/8/2004	PJR
SC-SC	12/22/2004	PJR
SC-WA	10/14/2004	ARG
SC-YB	4/23/2004	PJR
SC-YB	5/27/2004	PJR
SC-YB	7/3/2004	PJR
SC-YB	8/12/2004	PJR
SC-YB	11/8/2004	PJR
SC-YB	12/22/2004	PJR
SM-CH	1/8/2004	DVR
SM-CH	5/7/2004	DVR
SM-SM	1/8/2004	DVR
SM-SM	5/6/2004	DVR

Beach	Monitor Event Date	Primary Surveyor
SR-AC (includes TE)	4/8/2004	DVR
SR-AC	7/19/2004	DVR
SR-AC	10/13/2004	PJR
SR-BE	7/20/2004	DVR
SR-BW	7/20/2004	DVR
SR-CA	4/8/2004	DVR
SR-CA	7/20/2004	PJR
SR-CA	10/14/2004	PJR
SR-CL	7/20/2004	PJR
SR-SA	4/13/2004	DVR
SR-SA	7/20/2004	DVR
SR-SA	10/15/2004	PJR
SR-SK	4/9/2004	DVR
SR-SK	7/18/2004	DVR
SR-SK	10/11/2004	PJR
SR-SO	4/7/2004	DVR
SR-SO	7/19/2004	DVR
SR-SO	10/13/2004	PJR
SR-TE	7/19/2004	DVR
SR-TE	10/13/2004	PJR
SR-WC	4/10/2004	DVR
SR-WC	7/21/2004	DVR
SR-WC	10/11/2004	PJR
SR-WC	12/8/2004	DVR